GROWTH AND YIELD RESPONSE OF SWEET CORN (*Zea mays* L. *var. Saccharata*) AS AFFECTED BY TILLAGE OPERATIONS AND FERTILIZER APPLICATIONS

RONLEY C. CANATOY
Department of Soil Science,
College of Agriculture, Central Mindanao University
University Town, Musuan, Bukidnon, Mindanao, Philippines
Email Address: rcanatoy@gmail.com

Abstract

Field experiment was conducted on February 2016 to May 2016 at IPB-UPLB, Musuan, Bukidnon to determine the influence of tillage operations (conventional and zero) and the application of different rates of Vermicompost and inorganic fertilizers on the growth and yield of sweet corn. Experiment was laid in a Split-plot Randomized Complete Block Design with 12 treatments replicated 3 times.

Results show that the interaction of tillage operations and fertilizer rates did not influence the agronomic parameters of sweet corn. Conventional tillage had significant influence on the plant height at 60 and 70 DAS, ear height and average ear diameter of sweet corn. Higher yield was observed in conventional tillage (46404.67 ha^{-1}). Fertilizer rates were not able to significantly influence the growth and yield components of sweet corn. Conventional tillage was found more advantageous than zero tillage for sweet corn production.

Key Words: Sweet corn, Conventional tillage, Zero tillage, Fertilizer rates, growth, yield, ear

Introduction

The farmers in the Philippines at present are into various ways of devising techniques and practices that promotes efficiency in farming, particularly with crop farming. Crop farmers are looking into effective ways of farming that promotes both productivity and efficiency. Cultural practices like land preparation plays a very important role in the establishment of the crop in the field along with its performance to bear the expected yield.

Today, the demand for sweet corn had greatly increased because of its nutritional content and good palatability where, in all ages considers it to be a good choice for snacks and even an option for meal. These facts had brought farmers to increase the usual production of sweet corn. Thus, considering it to be a good venture for farming business due to its increasing demand and shorter time of maturity in the field.

The key to high quality sweet corn is rapid growth, adequate soil moisture and nutrients, and harvesting the ears at optimum maturity. Sweet corn requires rich soil with ample nitrogen and moisture. Soil moisture is found critical for the germination of sweet corn, as it absorb more water than other types for germination to occur (Cox, 2010). A wide variety of soils is suitable, moreover, it is important that the soil be well drained and well supplied with organic matter. The optimum range of pH for this crop is 5.8 to 7.0.

Tillage is a practice which is performed to loosen the soil and to produce a good tilth. Among the crop production factors tillage contributes up to 20% (Ahmad et al., 1996). Tillage method affects the sustainable use of soil resources through its influence on soil properties. Deep tillage breaks up high density soil layer, improves the water infiltration and movement in soil, enhances root growth, development and increases crop production potential. Deep tillage up to 90 cm soil depth results in increased corn yield (Versa et al., 1997).

Fertilizers are used to replenish the loss nutrients due to crop removal, erosion, fixation and immobilization. Crops when given the right form, amount and balance of essential nutrients, will eventually develop and exhibit good growth performance which is then directly related with its productivity. Achieving a good crop performance for production will be at ease if essential nutrients are supplied. Accordingly, this research was conducted to address and verify the influence brought by two tillage operations (conventional and zero) and application of different rates of fertilizer on the growth and yield of sweet corn.

Materials and Methods

A field experiment was conducted at the research station of Institute of Plant Breeding – University of the Philippines at Los Baños (IPB-UPLB) with coordinates 7° 51' 31.788'' N and 125° 3' 40.4568'' E, Central Mindanao University (CMU) Station in February 2016 to May 2016. The experiment was laid out in Split-plot following Randomized Complete Block Design (RCBD) with twelve (12) treatments and three (3) replications.

The main plots or factor A were the tillage operations, namely, zero tillage and conventional tillage. The subplots or factor B include the rates of Vermicompost and inorganic fertilizers. The recommended rate of inorganic fertilizer (RRIF) based on soil analysis is 70 – 50 – 0 N, P_2O_5, K_2O kg ha^{-1}.

The treatment combinations were the following: (T_1F_1) Zero tillage + No fertilizer, (T_1F_2) Zero tillage + RRIF, (T_1F_3) Zero tillage + 2 tons Vermicompost ha^{-1}, (T_1F_4) No tillage + ½ RRIF + 1 ton Vermicompost ha^{-1}, (T_1F_5) No tillage + ½ RRIF + 2 tons Vermicompost ha^{-1}, (T_1F_6) No tillage + RRIF + 1 ton Vermicompost ha^{-1}, (T_2F_1) Conventional tillage + No fertilizer, (T_2F_2) Conventional tillage + RRIF , (T_2F_3) Conventional tillage + 2 tons Vermicompost ha^{-1}, (T_2F_4) Conventional tillage + ½ RRIF + 1 ton Vermicompost ha^{-1}, (T_2F_5) Conventional tillage + ½ RRIF + 2 tons Vermicompost ha^{-1} and (T_2F_6) Conventional tillage + RRIF + 1 ton Vermicompost ha^{-1}.

Soil sampling was done in the area prior to land preparation to determine the fertilizer recommendation rate. Analysis was done at the Soil and Plant Analysis Laboratory, College of Agriculture, Central Mindanao University, Musuan, Bukidnon, Philippines.

The total land area used in the experiment was 962.50 m^2 (27.5 m x 35 m). It was then divided into six (6) blocks. A one (1) meter distance was observed in every block. Second, fourth and sixth blocks were assigned for the zero tillage blocks while first, third and fifth blocks were assigned for conventional tillage blocks. Each block contains six (6) experimental plots with one (1) meter distance per experimental plot. Each experimental plot has a dimension of 3.75 m x 5 m (18.75 m^2).

For zero tillage experimental plots, the plots were cleared by removing all the plant residues. A pre-emergence herbicide was applied to control emerging weeds. For conventional tillage, the field was plowed using an animal-drawn moldboard plow. Plowing was done twice at one week interval to destroy the weeds. Harrowing was done after plowing to further pulverize larger soil aggregates. Furrows were made at the time of planting at a distance of 75 cm between rows.

A planting distance of 25 cm x 75 cm was observed all throughout the experimental area. Dibble planting method was done on zero tillage experimental plots. While for conventional tillage plots the usual way of planting was employed. Sweet corn seeds were planted in the rows at one (1) seed per hill. Sown seeds were covered with fine soil immediately.

Split application of inorganic fertilizer particularly N was observed but full of the recommendation rate of Phosphorus and Potassium was observed all throughout the experimental area. The first application of inorganic fertilizer (N) was during the planting period and the second was at 33 DAS following side dress application for both tillage operations. It was at this stage were silking and tasseling of sweet corn took place. The Vermicompost was applied in the experimental plots assigned as treatment following the recommended rate of two (2) tons ha^{-1} of organic fertilizer. It was broadcasted within each plot before the seeding operation.

Ten (10) sample plants were randomly selected from data rows in each experimental plot. A sheet of white paper was stapled to each data plants to serve as marker and guide during data collection.

The data for plant heights were taken at 60 and 70 DAS (at harvest). Observations were obtained from 10 tagged plants in the data rows. Measured from the base up to the tip of the longest leaf was made using a meter stick.

Sweet corn is considered horticulturally mature and ready for fresh market consumption processing when the pollination silks were dried and the kernels are still immature. The husk leaves remain tight and had a good green appearance. The ear is firm and turgid. The kernels are plump and appear 'milky', and not doughy, when squeezed. At this point the kernels of standard 'sugary' corn are 70-75% water content and kernels of corn are at 77-78% water content. When the sweet corn exhibited the mentioned indices, the harvesting processes immediately commenced.

Harvesting was done at the horticultural maturity of the test crop. Maturity of the test crop was at 65 to 75 DAS. The harvest area per experimental plot was 8.44 m^2 or 3.75 m x 2.25 m. Harvesting operation was done manually with simple harvesting tool. After harvesting, appropriate postharvest methods were employed to preserve the overall quality of the produce.

Statistical analysis was done after tabulating the gathered data through the Statistical Tool for Agricultural Research (STAR) software. With the aid of the software, the two way analysis of variance between Tillage Operations and Fertilizer Applications were conducted. Moreover, some parameters were found significant as manifested in the F computed value, comparison of means then proceeded using Honestly Significance Difference (HSD) test as the Post hoc test undertaken.

DATA GATHERED

1. Germination Index. Germination index was obtained by counting the emerged seedlings starting from the day it was sown.
2. Plant Height, (cm). The average plant height was measured at 60 and 70 DAS (at harvest) within the harvest area of each plot. Data was sourced out from the 10 tagged plants in every experimental plot. Measurement was done by measuring the plant from base to its longest leaf.
3. Ear Height. The data for the ear height was obtained from the same tagged plants using the primary ear (first ear from above). A measuring stick was used to measure the height from the base of the plant towards the bottom portion of the primary ear.
4. Number of Marketable Ears (Yield ha^{-1}). Marketable ears were counted and identified based on the given criteria. All harvested ears in each experimental plot remained unhusked and sorted as to marketable and non-marketable.
5. Average Ear Diameter (cm). In determining the average ear diameter, the ears were first husked followed by gripping a measuring tape around the ear body. This was done on the ears of the ten (10) tagged plants.

Results and Discussion

Germination Index (GI)

The germination index is a measure of both percentage and speed of germination and assigns maximum arithmetic weight to embryos or seeds that germinate first and less weight to those that germinate later. Table 1 showed that the germination index among the treatments using the combined effects of treatments (tillage operations and fertilizer rates) did not significantly differ with each other. These results were opposite with that of Dezfuli et al. (2008) concerning the germination index of corn.

Comparing the tillage operations means, zero tillage (T_1) gave the higher germination index compared with conventional tillage (T_2). However, the two were not significantly different with one another based on a statistical analysis.

Moreover, it was also noted statistically that fertilizer rates based on their means had no significant difference among the six (6) rates. However, highest result was obtained on the application of ½ RRIF + 2 tons Vermicompost ha^{-1} (F_5) with value 15.15 while the lowest was on no fertilizer application (F_1) with value 13.88.

Plant height at 60 DAS

As depicted in Table 2, combinations of tillage operations and fertilizer rates did not significantly affect the height of sweet corn plants at 60 DAS. Experimental units with conventional tillage + 2 tons Vermicompost ha^{-1} (T_2F_3) had the tallest plants with an average

Table 1. Germination index of sweet corn as affected by tillage operations and fertilizer applications

TREATMENTS		GERMINATION INDEX
CODE	DESCRIPTION	
T_1F_1	NT + No fertilizer	15.20
T_1F_2	NT + Full RRIF	14.45
T_1F_3	NT + 2 tons Vermicompost ha^{-1}	13.64
T_1F_4	NT + ½ RRIF + 1 ton Vermicompost ha^{-1}	14.14
T_1F_5	NT + ½ RRIF + 2 tons Vermicompost ha^{-1}	14.69
T_1F_6	NT + Full RRIF + 1 ton Vermicompost ha^{-1}	15.21
T_2F_1	CT + No fertilizer	12.55
T_2F_2	CT + Full RRIF	14.22
T_2F_3	CT + 2 tons Vermicompost ha^{-1}	14.48
T_2F_4	CT + ½ RRIF + 1 ton Vermicompost ha^{-1}	13.67
T_2F_5	CT + ½ RRIF + 2 tons Vermicompost ha^{-1}	15.61
T_2F_6	CT + Full RRIF + 1 ton Vermicompost ha^{-1}	13.97
Factor A Means (Tillage Operations)		
	T_1 (No Tillage)	14.56
	T_2 (Conventional Tillage)	14.08
Factor B Means (Fertilizer Rates)		
	F_1 (No fertilizer)	13.88
	F_2 (Full RRIF)	14.34
	F_3 (2 tons Vermicompost ha^{-1})	14.06
	F_4 (½ RRIF + 1 ton Vermicompost ha^{-1})	13.91

	F_5 (½ RRIF + 2 tons Vermicompost ha^{-1})	15.15
	F_6 (Full RRIF + 1 ton Vermicompost ha^{-1})	14.59
F-test		
	A (Tillage Operations)	ns
	B (Fertilizer Rates)	ns
	A x B	ns
CV, %	Factor A (Tillage Operations)	14.30
CV, %	Factor B (Fertilizer Rates)	10.24

ns _ not significant at 5% level of significance

Table 2. Plant height of sweet corn (cm) at 60 and 70 DAS (at harvest) as affected by tillage operations and fertilizer applications

TREATMENTS		PLANT HEIGHT, cm	
CODE	DESCRIPTION	60 DAS †	70 DAS (At harvest) †
T_1F_1	NT + No fertilizer	185.70	188.00
T_1F_2	NT + Full RRIF	189.97	191.50
T_1F_3	NT + 2 tons Vermicompost ha^{-1}	198.70	198.00
T_1F_4	NT + ½ RRIF + 1 ton Vermicompost ha^{-1}	177.93	180.77
T_1F_5	NT + ½ RRIF + 2 tons Vermicompost ha^{-1}	184.70	191.72
T_1F_6	NT + Full RRIF + 1 ton Vermicompost ha^{-1}	193.47	194.20
T_2F_1	CT + No fertilizer	195.30	197.73
T_2F_2	CT + Full RRIF	207.87	203.93
T_2F_3	CT + 2 tons Vermicompost ha^{-1}	209.67	211.47
T_2F_4	CT + ½ RRIF + 1 ton Vermicompost ha^{-1}	188.90	192.93
T_2F_5	CT + ½ RRIF + 2 tons Vermicompost ha^{-1}	202.60	204.17
T_2F_6	CT + Full RRIF + 1 ton Vermicompost ha^{-1}	198.70	201.20
Factor A Means (Tillage Operations)			
	T_1 (No Tillage)	188.41 b	190.70 b
	T_2 (Conventional Tillage)	200.51 a	201.91 a
Factor B Means (Fertilizer Rates)			
	F_1 (No fertilizer)	190.50	192.87
	F_2 (Full RRIF)	198.92	197.72
	F_3 (2 tons Vermicompost ha^{-1})	204.19	204.74

	F_4 (½ RRIF + 1 ton Vermicompost ha^{-1})	183.42	186.85
	F_5 (½ RRIF + 2 tons Vermicompost ha^{-1})	193.65	197.95
	F_6 (Full RRIF + 1 ton Vermicompost ha^{-1})	196.09	197.70
F-test			
	A (Tillage Operations)	*	*
	B (Fertilizer Rates)	ns	ns
	A x B	ns	ns
CV, %	Factor A (Tillage Operations)	1.90	2.15
CV, %	Factor B (Fertilizer Rates)	9.26	8.46

† Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD

ns _ not significant at 5% level of significance

height of 209.67 cm, whereas, experimental units with zero tillage + ½ RRIF + 1 ton Vermicompost ha^{-1} (T_1F_4) gave the shortest plants with an average value of 177.93 cm.

Among the two (2) tillage operations, conventional tillage (T_2) gave a significant taller plant height of 200.51 cm compared to zero tillage (T_1) at a value of 188.41 cm. The taller plants of the conventional tillage may be attributed to the relative ease as to with nutrient scouting, the fact that the soil was cultivated well. Aeration may also play a very important role on plants' further development due to deeper root penetration and more area for nutrient acquisition compared with that of no tillage. However, this result was opposite with that of Thiagalingam et al. (1996) who reported that crops grown under conventional tillage would fail to establish successfully. Moreover, no tillage operation had exhibited better rooting ability, water utilization, and more rapid development.

The fertilizer rates with 2 tons Vermicompost ha^{-1} (F_3) had the tallest plant heights with an average value of 204.19 cm. While treatments with ½ RRIF + 1 ton Vermicompost ha^{-1} (F_4) had the shortest plants with an average height of 183.42 cm. Statistical analysis would disclose that there's no significant effects of fertilizer rates towards the height of corn at 60 DAS.

Plant height 70 DAS (at harvest)

The plant heights of sweet corn at harvest (70 DAS) as influenced by tillage operations and fertilizer rates ranged from 180.77 cm to 211.47 cm. Statistical analysis revealed that effects of the interactions between the tillage operations and fertilizer applications were not significantly different with one another as presented in Table 2.

Tillage operations exhibited a significant difference based on statistical analysis on the plant height of sweet corn at harvest (70 DAS). Zero tillage (T_1) had a value of 190.70 cm while conventional tillage (T_2) had 201.91 cm. Sweet corn plants at this stage are still growing and it manifested that those that were planted on experimental units treated with conventional tillage gave a significant taller height than that of plants in no tillage experimental units.

The fertilizer rates gave no significant difference on the height of sweet corn at harvest (70 DAS). However, it was noted that in treatment with ½ RRIF + 1 ton Vermicompost ha^{-1} (F_4) had the shortest height with a value of 186.85 cm. On the other hand, tallest was observed in treatment with 2 tons Vermicompost ha^{-1} (F_3) with a value of 204.74 cm.

Ear height

Table 3 shows the ear height of sweet corn plants. Ear height is a very important characteristic for breeding. The higher it is, the more ears can develop from the nodes below (Zsubori et al, n.d). However, if it is too high the weight of the ear may bend the stalk or even break it. Ear height of sweet corn plants as influenced by the interactions between tillage operation and fertilizer rates provided values from 81.50 cm to 95.40 cm. It was in plants treated with no tillage + ½ RRIF + 1 ton Vermicompost ha^{-1} (T_1F_4) that had the shortest ear height with a value of 81.50 cm while in those plants treated with conventional tillage + full RRIF (T_2F_2) with a value of 95.40 cm. Statistical analysis revealed that the interactions of tillage operations and fertilizer rates did not significantly influence the ear height of corn.

Tillage operations was found to give an effect towards the ear height of sweet corn. Higher ear height was found on T_2 (conventional tillage) with a value of 91.79 cm while on T_1 (Zero tillage) was the shorter ear height with a value of 86.07 cm. According to Hofmann (2015), the reason why conventional tillage had a significant effect was due to the increased porosity of the loosen soil allowing for good air exchange (aeration), root growth and further development resulting into more nutrients being scouted from the soil leading into a more nourished plant.

The fertilizer rates having values from 85.52 cm to 92.25 cm did not significantly affect the ear height of sweet corn. However, the highest height was noted on treatment with 2 tons Vermicompost ha^{-1} (F_3) while the shortest ear height was on ½ RRIF + 1 ton Vermicompost ha^{-1} (F_4).

Table 3. Ear height (cm) of sweet corn as affected by tillage operations and fertilizer applications

TREATMENTS		EAR HEIGHT, † (cm)
CODE	DESCRIPTION	
T_1F_1	NT + No fertilizer	86.20
T_1F_2	NT + Full RRIF	85.53
T_1F_3	NT + 2 tons Vermicompost ha^{-1}	89.20
T_1F_4	NT + ½ RRIF + 1 ton Vermicompost ha^{-1}	81.50
T_1F_5	NT + ½ RRIF + 2 tons Vermicompost ha^{-1}	83.47
T_1F_6	NT + Full RRIF + 1 ton Vermicompost ha^{-1}	90.50
T_2F_1	CT + No fertilizer	85.23
T_2F_2	CT + Full RRIF	95.40
T_2F_3	CT + 2 tons Vermicompost ha^{-1}	95.30
T_2F_4	CT + ½ RRIF + 1 ton Vermicompost ha^{-1}	89.53
T_2F_5	CT + ½ RRIF + 2 tons Vermicompost ha^{-1}	94.30
T_2F_6	CT + Full RRIF + 1 ton Vermicompost ha^{-1}	90.97
Factor A Means (Tillage Operations)		
	T_1 (No Tillage)	86.07 b
	T_2 (Conventional Tillage)	91.79 a
Factor B Means (Fertilizer Rates)		

	F_1 (No fertilizer)	85.72
	F_2 (Full RRIF)	90.47
	F_3 (2 tons Vermicompost ha^{-1})	92.25
	F_4 (½ RRIF + 1 ton Vermicompost ha^{-1})	85.52
	F_5 (½ RRIF + 2 tons Vermicompost ha^{-1})	88.89
	F_6 (Full RRIF + 1 ton Vermicompost ha^{-1})	90.74
F-test		
	A (Tillage Operations)	*
	B (Fertilizer Rates)	ns
	A x B	ns
CV, %	Factor A (Tillage Operations)	3.16
CV, %	Factor B (Fertilizer Rates)	9.10

† Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD

ns _ not significant at 5% level of significance

Number of Marketable Ears, ha^{-1}

Marketable yield refers to the produce that do have an economic value because it had passed that criteria set by specific individuals that do have the purchasing capacity. In this experiment as presented in Table 4, the joint effects of tillage operations and fertilizer rates gave values that ranged from 44524 to 49573 per hectare. Lowest number of marketable yield was obtained on sweet corn plants in zero tillage + no fertilizer (T_1F_1) with a value of 44524 ha^{-1} while those sweet corn plants with zero tillage + 2 tons Vermicompost ha^{-1} (T_1F_3) had a number of 49573 ha^{-1} and was classified to have the highest number of marketable ears. However, marketable ears were not significantly different from one another based on statistical analysis. The same findings was observed by Dulay (2009).

Tillage operations insignificantly affected the number of marketable ears of sweet corn. Zero tillage (T_1) with a marketable ear number of 46,053 ha^{-1} is lower than that of the number of ears of conventional Tillage (T_2) with a number of 46,405 ha^{-1}. This result was in consonance with the result of Sessiz et al. (2010) that conventional tillage would give greater yield as being verified and reported also by Yalcin and Cakir (2006).

The fertilizer rates manifested result of the number of marketable sweet corn ears from 44,874 ha^{-1} to 48,073 ha^{-1}. Statistical analysis revealed that the means of fertilizer rates are not significantly different from one another. However, it was on treatment with No fertilizer (F_1) that had the lowest number of marketable ears with a value of 44874 ha^{-1} while on plots treated with 2 tons Vermicompost ha^{-1} (F_3) was the treatment with the highest number of marketable ears with a value of 48073 ha^{-1}. Lazcano and Domínguez (2011) also reported the same findings that grain content of the marketable ear was higher in response to Vermicompost application.

Ear Diameter

The combined effects of Conventional tillage + 2 tons Vermicompost ha^{-1} (T_2F_3) lead into the largest ear diameter with a value of 5.13 cm, while treatment with zero tillage + ½ RRIF + 1 ton Vermicompost ha^{-1} (T_1F_4) had the smallest ear diameter with a value of 4.60 cm.

Table 4. Number of marketable ear per hectare of sweet corn as affected by tillage operations and fertilizer applications

TREATMENTS		NUMBER OF MARKETABLE EARS, ha^{-1}
CODE	DESCRIPTION	
T_1F_1	NT + No fertilizer	44524
T_1F_2	NT + Full RRIF	45668
T_1F_3	NT + 2 tons Vermicompost ha^{-1}	49573
T_1F_4	NT + ½ RRIF + 1 ton Vermicompost ha^{-1}	44600
T_1F_5	NT + ½ RRIF + 2 tons Vermicompost ha^{-1}	46164
T_1F_6	NT + Full RRIF + 1 ton Vermicompost ha^{-1}	45787
T_2F_1	CT + No fertilizer	45225
T_2F_2	CT + Full RRIF	48156
T_2F_3	CT + 2 tons Vermicompost ha^{-1}	46573
T_2F_4	CT + ½ RRIF + 1 ton Vermicompost ha^{-1}	46025
T_2F_5	CT + ½ RRIF + 2 tons Vermicompost ha^{-1}	45889
T_2F_6	CT + Full RRIF + 1 ton Vermicompost ha^{-1}	46560
Factor A Means (Tillage Operations)		
	T_1 (No Tillage)	46053
	T_2 (Conventional Tillage)	46405
Factor B Means (Fertilizer Rates)		
	F_1 (No fertilizer)	44874
	F_2 (Full RRIF)	46912
	F_3 (2 tons Vermicompost ha^{-1})	48073
	F_4 (½ RRIF + 1 ton Vermicompost ha^{-1})	45312
	F_5 (½ RRIF + 2 tons Vermicompost ha^{-1})	46027
	F_6 (Full RRIF + 1 ton Vermicompost ha^{-1})	46173
F-test		
	A (Tillage Operations)	ns
	B (Fertilizer Rates)	ns
	A x B	ns
CV, %	Factor A (Tillage Operations)	7.19
CV, %	Factor B (Fertilizer Rates)	5.15

ns _ not significant at 5% level of significance

The interactions between the tillage operations and fertilizer rates towards the ear diameter of sweet corn were found not significantly different with one another as reflected in Table 5.

The tillage operations marked a significant difference in terms of influence towards the ear diameter of sweet corn. The ear diameter of plants planted in plots treated with conventional tillage (T_2) had a value of 4.95 cm which is significantly higher than that of plants in plots with zero tillage (T_1) operations given with a value of 4.71 cm. This result coincides with the result of Guan et al. (2013) where ear diameter was affected by tillage operations and is higher under conventional tillage operations. Moreover, the above-ground growth and yield is greatly dependent on the root system (Jeschke et al. 1997), and root development and distribution in the soil profile determine the capacity for nutrient uptake and water extraction by crop plants (Fageria, 2004).

Fertilizer rates gave no significant effect towards the ear diameter of sweet corn. Results ranged from 4.68 cm to 4.98 cm. The smallest diameter was obtained from treatment with No fertilizer (F_1) while the largest was on treatment with 2 tons Vermicompost ha^{-1} (F_3), however, this result contradicts to the findings of Simon and Balabbo (2015). They reported that inorganic fertilizer has greater capacity in increasing the ear diameter of sweet corn than that of Vermicompost. On the other hand, statistical analysis would declare that differences between the subplot treatments are not significant.

Table 5. Ear diameter (cm) of sweet corn as affected by tillage operations and fertilizer applications

TREATMENTS		EAR DIAMETER, † (cm)
CODE	DESCRIPTION	
T_1F_1	NT + No fertilizer	4.63
T_1F_2	NT + Full RRIF	4.63
T_1F_3	NT + 2 tons Vermicompost ha^{-1}	4.83
T_1F_4	NT + ½ RRIF + 1 ton Vermicompost ha^{-1}	4.60
T_1F_5	NT + ½ RRIF + 2 tons Vermicompost ha^{-1}	4.77
T_1F_6	NT + Full RRIF + 1 ton Vermicompost ha^{-1}	4.77
T_2F_1	CT + No fertilizer	4.73
T_2F_2	CT + Full RRIF	5.00
T_2F_3	CT + 2 tons Vermicompost ha^{-1}	5.13
T_2F_4	CT + ½ RRIF + 1 ton Vermicompost ha^{-1}	4.93
T_2F_5	CT + ½ RRIF + 2 tons Vermicompost ha^{-1}	4.93
T_2F_6	CT + Full RRIF + 1 ton Vermicompost ha^{-1}	4.97
Factor A Means (Tillage Operations)		
	T_1 (No Tillage)	4.71 b
	T_2 (Conventional Tillage)	4.95 a
Factor B Means (Fertilizer Rates)		
	F_1 (No fertilizer)	4.68
	F_2 (Full RRIF)	4.82
	F_3 (2 tons Vermicompost ha^{-1})	4.98
	F_4 (½ RRIF + 1 ton Vermicompost ha^{-1})	4.77

	F_5 (½ RRIF + 2 tons Vermicompost ha^{-1})	4.85
	F_6 (Full RRIF + 1 ton Vermicompost ha^{-1})	4.87
F-test		
	A (Tillage Operations)	*
	B (Fertilizer Rates)	ns
	A x B	ns
CV, %	Factor A (Tillage Operations)	0.91
CV, %	Factor B (Fertilizer Rates)	3.58

† Means followed by the same letter(s) are not significantly different at 5% level of significance based on HSD

ns _ not significant at 5% level of significance

Conclusion and Recommendation

Tillage operations and fertilizer applications gave no significant influence or effects towards the agronomic parameters of sweet corn. Moreover, no significance may also be attributed to the adverse climatic condition during the conduct of the experiment along with weekly irrigation scheme. Thus, no rain was experienced on the duration of the experiment which may probably affect some of the important interactions and processes.

Conventional tillage operation was found to be more advantageous and beneficial than zero tillage. Vermicompost was not able to significantly influence the growth and yield of sweet corn.

Among the treatments, it is conventional tillage + 2 tons Vermicompost ha^{-1} that manifested better results, however, it is recommended that further study be conducted to verify the result.

The experiment conducted fell under an adverse condition known as El Niňo. The maximum temperature in the experimental area was 33^oC and a minimum of 17.4^oC. The relative humidity was at 74% to 75.4% and a very minimal rainfall of 5.7 to 17.0 mm. Thus, it is recommended that further studies may be conducted to verify the acceptable influence brought by conventional tillage along with the application of Vermicompost as an organic fertilizer. Moreover, to precisely and accurately see the influence of organic fertilizer on the growth and yield of sweet corn, it is recommended to look for area that has deficient organic matter content in order to give really an account to the effect brought by organic fertilizer. In this experiment, it may be that the effect of Vermicompost is no longer evident, thus found insignificant due to the inherent existence of marginal amount of organic matter.

References

COX, ROBERT. (2010). Growing Sweet Corn in the Backyard Garden. 888 E. Iliff Avenue, Denver,CO80210.http://www.colostate.edu/Dept/CoopExt/4dmg/Veg Fruit/corn.htm

DEZFULI, PEGAH MORADI, F. SHARIF-ZADEH and M. JANMOHAMMADI. (2008). Influence of Priming Techniques on Seed Germination Behavior of Maize Inbred Lines (*Zea mays L.*). ARPN Journal of Agricultural and Biological Science vol. 3, no. 3, May 2008 pp. 22-25.

DULAY, ALLAN B. (2009). Effect of Tillage and Animal Manure on the Growth and Yield of Sweet Corn. Unpublished Undergraduate Thesis, Benguet State University, La Trinidad, Benguet.

FAGERIA, N.K. (2004). Influence of dry matter and length of roots on growth of five field crops at varying soil zinc and copper levels. J. Plant Nutr. 27, 1517–1523.

GUAN, D., M.M. AL-KAISI, Y. ZHANG, L. DUAN, W. TAN, M. ZHANG and Z. LI. (2013). Tillage practices affect biomass and grain yield through regulating root growth, root-bleeding sap and nutrients uptake in summer maize. Field Crops Research 157 (2014) 89–97.

HOFMANN, NANCY. (2015). Conventional tillage: How conventional is it? http://www.statcan.gc.ca/pub/16-002-x/2008003/article/10688-eng.htm (Date accessed: May 7, 2016)

JESCHKE, W.D., A. BAIG, A. HILPERT. (1997). Sink-stimulated photosynthesis, increased transpiration and increased demand-dependent stimulation of nitrate uptake: nitrogen andcarbon relations in the parasitic association Cuscuta reflexa–Coleus blumei. J. Exp. Bot. 48, 915–925.

LAZCANO, C.□ and J. DOMÍNGUEZ. (2011). The use of Vermicompost in Sustainable Agriculture: Impact on Plant Growth and Soil Fertility. Nova Science Publishers, Inc.

SESSIZ, A., A. ALP and S. GURSOY. (2010). Conservation and conventional tillage methods on selected soilphysical properties and corn (*Zea mays* L.) yield and quality under croppin system in Turkey.*Bulg. J. Agric. Sci.,* 16: 597-608.

SIMON, S. R. and F.P. BALABBO. (2015). Yield Performance of Sweet Corn (Zea Mays Var. Saccharata) Using Vermicompost as a Component of Balanced Fertilization Strategy. (IJCEBS) Volume 3, Issue 3 (2015) ISSN 2320–4087.

THIAGALINGAM, K., N. P. DALGLIESH, N. S. GOULD, R. L. McCOWN, A. L.COGLE and A. L. CHAPMAN. (1996). Comparison of no-tillage and conventional tillage in the development of sustainable farming system in the semi-arid tropics. Australian Journal of Experimental Agriculture, 1996, 36, 995-1002.

YALCIN, H. and E. CAKIR. (2006). Tillage effects and energy efficiencies of subsoiling and direct seeding in light soil on yield of second crop corn for silage in Western Turkey. *Soil & Tillage Research,* 90: 250- 255.

ZSUBORI, Z., Z.G. HEGYI, O. ILLÉS, I. PÓK, F. RÁCZ and C. SZŐKE. (n.d). Inheritance of Plant and Ear Height in Maize (*Zea Mays* L.). Agricultural Research Institute of the Hungarian Academy of Sciences, Martonvásár.

Acknowledgement

The author would like to express his warmest Christian thanksgiving to all who made themselves available during and after the conduct of the study. Your help means a lot and would be treasured by the author in his life. To God be all the glory!